

ABSTRACT

The present invention provides an innovative material which has properties which cannot be achieved with
5 conventional materials, i.e., having satisfactory high corrosion resistance and high strength in very severe corrosive conditions, for example, a 75% sulfuric acid (H_2SO_4) aqueous solution (180°C) in addition to high strength at high temperatures and high toughness at low temperatures,
10 and provides a method for effectively manufacturing the innovative material.

A worked molybdenum-alloy material, subjected to nitriding, which has high corrosion resistance, high strength, and high toughness, includes fine nitride
15 particles formed by subjecting a nitride-forming-metal element dissolved to form a solid solution in an untreated worked molybdenum-alloy material to internal nitriding, the fine nitride particles being dispersed inside the worked molybdenum-alloy material subjected to nitriding; and a
20 molybdenum nitride layer formed by subjecting a worked structure or a recovered structure at the surface of the untreated worked molybdenum-alloy material to external nitriding, the molybdenum nitride layer being provided at the surface of the worked molybdenum-alloy material
25 subjected to nitriding. A method for manufacturing a worked

molybdenum-alloy material subjected to nitriding includes the steps of subjecting an untreated worked alloy material in which at least any one of titanium, zirconium, hafnium, vanadium, niobium, and tantalum is dissolved to form a solid solution to multi-step internal nitriding treatment including a stepwise increase of the treatment temperature, and then subjecting the worked alloy material to external nitriding treatment.